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SDC
SOLENOIDAL DETECTOR NOTES

THE RESULTS ON NEW CEMENT COMPOSITE MATERIALS TEST FOR SDC DETECTORS LOW ENERGY NEUTRONS SHIELDING

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In that paper some results on optimization of cement composites for radiation protection of SDC detectors are presented. In our previous report (SDC-92-414, SDC-Note 93-513. I.Azhgirey et al., "The shield of SDC elementsfrom low energy n/gamma background") the experimental installation for simulation of low energy neutron spectrum at SDC was described together with the first results. Now we have improved as the cement composite materials composition as the performance of the experiment. To avoid the main background the additional shield was mounted aroundthe graphite filter up to its uppers surface.

New data on initial neutron spectrum behind graphite filter were obtained by the Bonner ball spectrometer. In the present paper we show the comparison of results for the neutron flux attenuation factors (K) for standard concrete, boron polyethylene (3%) and modified composite materials on the cement base. The composition of the new composite materials was slightly changed, but the weight concentrations of H, C and B nuclides are approximately the same as indicated in previous report.

In the following tables some preliminary results of our investigation are given. One can see, that from the point of view SDC low energy

neutron problems the new cement composites are close to boron polyethylene and more preferable on the other parameters (inflammable, cost, etc.).

Table 1.

The attenuation factor K [n/cm^2 per 1 n/cm ^{2} plane source] for standard concrete:

Distance, cm	0	5	10	15	20	25	30
Measured	1	6.3E-1	3.7E-1	2.2E-1	1.2E-1	7.3E-2	3.8E-2
(exp.err.)		(5%)	(5%)	(5%)	(5%)	(10%)	(16%)
Calculated :							
flux	1	7.5E-1	3.9E-1	1.9E-1	9.7E-2	5.0E-2	2.7E-2
current		5.0E-1	2.4E-1	1.2E-1	5.9E-2	3.1E-2	1.6E-2

Table 2.

The attenuation factor K [n/cm per 1 n/cm plane source] for boron composite 1 (close to bet 1 in previous report)

Distance, cm	0	5	10	15	20	25	30
Measured	1	4.8E-1	2.2E-1	1.1E-1	4.7E-2	2.3E-2 I	1.2E-2
(exp.err.)		(5%)	(5%)	(5%)	(10%)	(13%)	(16%)
Calculated	1	4.4E-1	1.8E-1	8.4E-2	4.2E-2	2.3E-2	1.3E-2
flux,curr.		2.9E-1	1.2E-1	5.2E-2	2.6E-2	1.4E-2	8.1E-2

Table 3.

The attenuation factor K [n/cm^2 per 1 n/cm^2 plane source] for boron composite 2 (close to bet 2b in previous report)

Distance, cm	0	5	10	15	20	25	30
Measured	1	3.3E-1	1.1E-1	4.2E-2	1.1E-2	5.2E-3	2.2E-3
(exp.err.)		(6%)	(6%)	(6%)	(14%)	(10%)	(14%)
Calculated	1	2.8E-1	6.7E-2	2.4E-2	1.1E-2	6.1E-3	3.4E-3
flux,curr.		1.8E-1	4.3E-2	1.6E-2	7.5E-2	4.0E-3	2.2E-3

Table 4.

The attenuation factor K [n/cm^2 per 1 n/cm^2 plane source] for boron polyethylene (3% natural B)

Distance, cm	0	8	16	24
Measured	1	3.7E-2	7.7E-3	1.7E-3
(exp.err.)		(6%)	(13%)	(18%)
Calculated	1	2.7E-2	5.6E-3	1.7E-3
flux,curr.		1.9E-2	3.9E-3	1.2E-3